# APPENDIX D

# Field Sampling for OU 10-04: Organic-Moderated Reactor Experiment Area and Leach Pond

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## D-1. INTRODUCTION

This Operable Unit (OU) 10-04 Remedial Investigation/Feasibility Study (RI/FS) Health and Safety Plan (HASP) appendix establishes the procedures and requirements that will be used to eliminate and/or minimize health and safety risks to persons working at the OU 10-02 Organic Moderated Research Experiment (OMRE) area and leach pond. For more information on the requirements of the Occupational Safety and Health Administration (OSHA) standard, 29 Code of Federal Regulations (CFR) 1910.120/1926.65, "Hazardous Waste Operations and Emergency Response (HAZWOPER)," see Section 1 of the HASP.

### D-1.1 INEEL Site Description

For details on the location and operational history of the Idaho National Engineering and Environmental Laboratory (INEEL), see Section 1 and Figure 1 of this HASP.

### D-1.2 OMRE-1 and Leach Pond Background and Description

The OMRE was a 12-MW-thermal reactor that operated from 1957 to 1963 and was located approximately 6.25 km (2 mi) east of the Central Facilities Area (CFA) (Figure D-1) near the present-day Security Training Facility (STF). The OMRE leach pond, located approximately 91 m (300 ft) east of the OMRE facility, was a soil-covered hole based on natural basalt. Pond dimensions at the berm top were approximately 8 by 22 m (26 by 72 ft) and at the base were approximately 5 by 15 m (16 by 49 ft). Soil depth to basalt in the base varied from 30 cm (12 in.) at the east end to 46 cm (18 in.)at the west end. The leach pond and surrounding area is currently controlled as a soil contamination area. The entire soil contamination area is covered with grass, but a slightly mounded area with more lush vegetation (in 1997) indicates the former pond location. Past data are available from the OMRE operations disposal records, decontamination and decommissioning (D&D) characterization in 1979, 1988 U.S. Department of Energy (DOE) Survey, Environmental Monitoring Program's annual survey, and from sampling conducted by Environmental Restoration in 1997 and 1998.

From 1957 to 1963, discharges to the pond could have amounted to 211,960 L (56,000 gal) of radioactive aqueous waste and 3.8 million L (1 million gal) of reactor cooling water. The OMRE reactor coolant consisted primarily of high-boiling-point organic compounds similar to wax; however, neutron bombardment decomposed some compounds to low-boiling-point organics including hazardous materials such as benzene, toluene, ethylbenzene, and xylene. These discharges contained approximately 2.35 Ci of various, primarily short-lived, radionuclides including Mn-54, Fe-59, Sr-89/90, Zr-95, Nb-95, Ru-103, Ru-106, Rh-106, I-129, I-131, Cs-137, Ce-141/144, and unidentified beta-gamma (noted as less than 10%). In 1959, two radioactive discharges totaling 0.4 μCi and 2,687 L (757 gal) were recorded as being discharged to a ditch outside the OMRE. An additional 1959 discharge of 0.9 μCi and 22,710 L (5,999 gal) was reported as being released to a trench outside OMRE. The contaminants noted for the

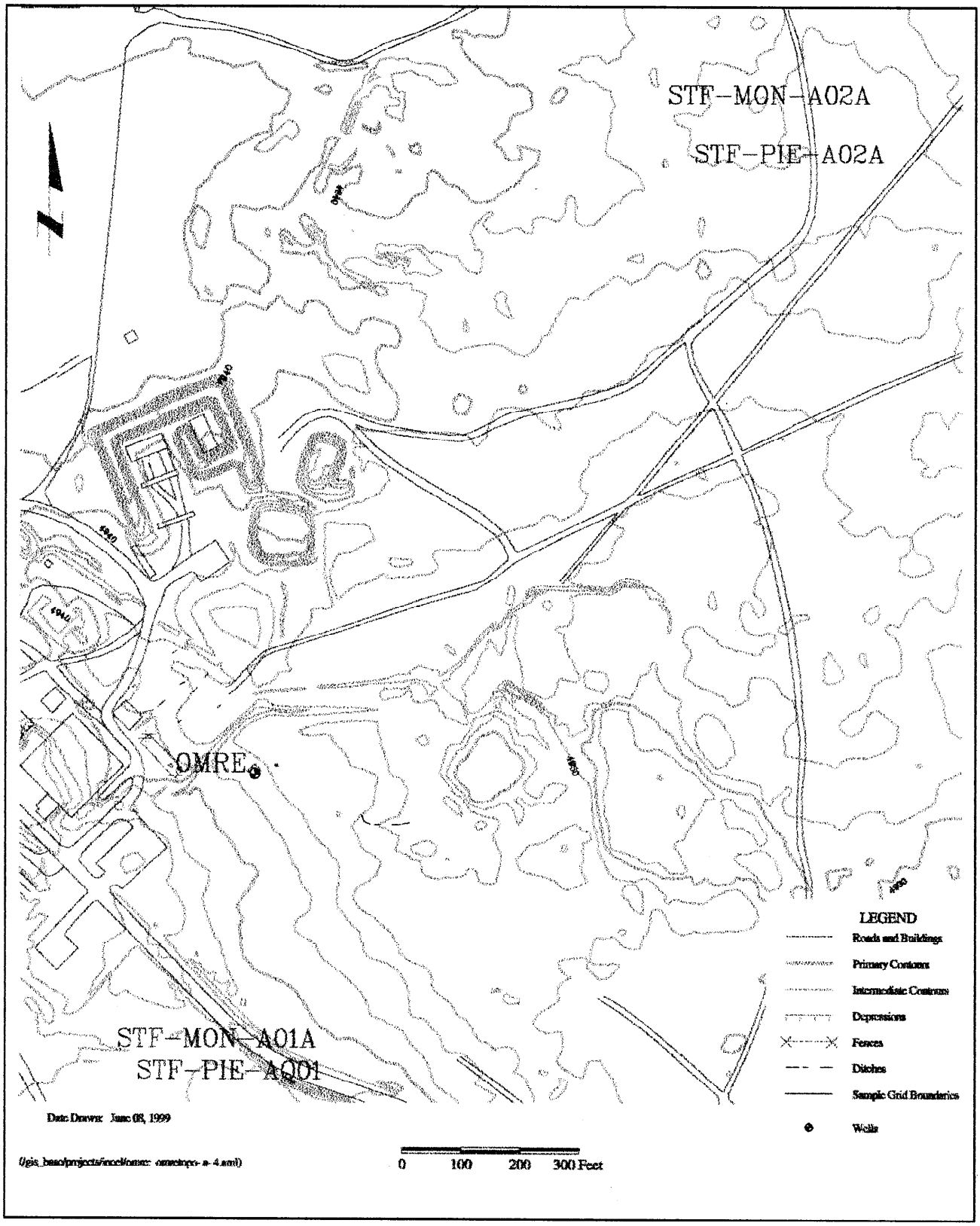


**Figure D-1.** Location of the OMRE area at the INEEL.

latter discharge are P-32, S-35, Mn-54, Co-58, Fe-59, Co-60, I-131, Bo-140, La-140, and xylene particulate. Three xylene releases to the pond were reported totaling 1,300 L (355 gal), which likely carried radionuclides and organic compounds (Chapin 1979).

In 1979, during D&D characterization to determine the need for pond excavation, radionuclide contamination (unvalidated data) was found throughout the sediment underlying the pond and pond berm. No assessment was made of semivolatile organic compounds (SVOCs) or volatile organic compounds (VOCs). Analysis results showed Eu-152 (observed only in surface soil samples) and Pu-239/240 (observed in a single soil sample) at maximum concentrations of 3.4 ± 1.1 and 0.031 ± 0.003 pCi/g respectively. The principal radionuclides identified in the pond soils were Cs-137, Co-60, and Sr-90. Radionuclide concentrations were greatest at the basalt surface with maximums of 6,674 ± 31, 1,518 ± 17, and 650 ± 80 pCi/g, for Cs-137, Co-60, and Sr-90, respectively. Maximum radionuclide concentrations in the berm were 425 ± 4, 220 ± 4, and 43 ± 5 pCi/g for Cs-137, Co-60, and Sr-90, respectively. In the pond base, Co-60 and Cs-137 were observed in three basalt cores collected in 15.2 cm (6 in.) increments down to 61 cm (24 in.). The highest Co-60 and Cs-137 concentrations in the 0 to 15.2 cm (0 to 6 in.) basalt core were 9 ± 1 and 26 ± 1 pCi/g, respectively. Concentrations of Co-60 and Cs-137 the 46 to 61 cm (18 to 24 in.) basalt cores dropped to 2.3 ± 0.7 and 0.9 ± 0.5 pCi/g, respectively. The D&D postcharacterization report (Chapin 1979) suggested that only portions of the pond's base (based on cleanup to 1,000 pCi/g) needed to be excavated. While it is thought that D&D completed partial excavation and backfilled the excavation with soil, no final D&D report was written for the OMRE leach pond excavation and no D&D verification sample data are known to exist.

In 1988, the DOE survey collected three grab soil samples for metals, extractable organics, and volatile organics analyses from the pond sediments approximately 0.31 m (1 ft) above the basalt. Seven metals of interest (barium, beryllium, chromium, copper, mercury, nickel, and zinc) were detected in the samples at levels consistent with naturally occurring metals. The only positively identified compound in the extractable organics analysis was bis- (2-ethylhexyl) phthalate, which was detected below the detection limit in one sample, but estimated concentrations of tentatively identified compounds (TICs) reached 6,400 ppb in that sample. Two compounds detected in all three soil samples analyzed for volatile organics were methylene chloride (41 to 69 ppb) and 1,1,1-trichloroethane (TCA) (21 to 51 ppb).

The Environmental Monitoring Program surveys direct radiation annually in the OMRE soil contamination area with a truck-mounted detector system as part of their Radiological Environmental Surveillance Program. Environmental Monitoring documents the results from these surveys in an annual report, which, each year, generally shows the same 14 OMRE surficial radiological hotspots, none of which exceed 1 mR/hr.

In 1997, OU 10-04 investigated radionuclides and metals in soil, verified the presence of organic contamination in the vadose zone, and discovered radionuclide-contaminated soil and stained soil in a nearby ditch. For the radionuclides and metals, samples were collected from nine boreholes augered to basalt. In addition, radioactive hotspots located using hand-held radiation detection instruments (including two found in an adjacent ditch) were staked, surveyed with a global positioning system (GPS), and entered in the Environmental Restoration Information System (ERIS) database. The nine soil boreholes included five collected directly over the former pond, two collected from nearby radiological hotspots, and two collected from an adjacent ditch. Basalt was reached in each borehole before the 3-m (10-ft) maximum sampling depth. The maximum observed depth to basalt was 2.4 m (8.5 ft). The primary manmade radionuclides observed were Cs-137, Co-60, and Sr-90. Maximum concentrations of Cs-137, Co-60, Sr-90, and Pu-239/240 were 240 ± 7.7, 18.4 ± 0.6, 33.5 ± 1.72, and 0.47 ± 0.05 pCi/g, respectively. The maximum Cs-137 concentration occurred in the 10.2 to 30.5 cm (4 to 12 in.) depth in a radiological hotspot sample location near the pond. The Co-60 and Sr-90 maximum concentrations and the second highest Cs-137 concentration occurred in the 0.9 to 1.9 m (3 to 6 ft) depth interval in a pond borehole location. The Pu-239/240 was observed in the surface composite sample collected from the

adjacent ditch. Additional data to characterize the radionuclide and metals are not needed and these data will be evaluated in the OU 10-04 RI/FS.

In 1997, for the organic contamination in the vadose zone, the OU 10-04 field team completed a passive soil-gas screening survey in the former pond location and surrounding soils (the results are further detailed in Subsection 3.2.1.2 of the FSP (DOE-ID 1999a) because of their potential significance to ground water). The passive soil-gas test was a sensitive screening tool used to help qualitatively determine if organic contamination, especially xylene, which was expected to exist in the subsurface. Xylene was not detected, but 1,1,1-TCA and other compounds were.

In January 1998, an active soil gas survey verified low levels of 1,1,1-TCA in the two locations that the fiscal year (FY)-97 passive soil-gas survey showed to have the highest relative concentrations of 1,1,1-TCA. The levels detected by the active soil gas test (approximately 1 to 2 ppm) were at the detection limit of the active soil gas instrumentation. The agencies determined that Lockheed Martin Idaho Technologies Company (LMITCO) should not pursue more sensitive field instrumentation, but because neither of these screening surveys were quantitative, decided that limited definitive data were warranted to support risk assessment and remedial decisions.

Under this plan, solid waste (including paper, decontamination wipes, and disposable personal protective equipment [PPE]), generated in the immediate OMRE area will be handled as unknown pending analysis. Additionally, the subsurface materials (greater than 15.24 cm [6 in.]) generated in the immediate OMRE area as part of this investigation, including soil, basalt, interbed material, perched water, and ground water, will also be handled as unknown pending analysis. Ground water collected outside the immediate OMRE area (i.e., in the BFW and U.S. Geological Survey [USGS]-107 well) is not unknown and will be disposed of per historical data. All waste disposal will be coordinated with the appropriate waste generator interface to ensure compliance with applicable waste characterization, treatment, and disposal regulations.

## D-1.3 Source, Nature, and Extent of Contamination

Two primary classes of waste are of most significant concern at the OMRE leach pond: (1) radionuclides and (2) organics. The expected contaminants include Cs-137, Co-60, Sr-90, Pu-239/240, Eu-152, and 1,1,1-TCA and other organic compounds. Maximum concentrations of the Cs-137, Co-60, Sr-90, and Pu-239/240 observed in FY-97 samples collected in the leach pond area were $240 \pm 7.7$, $18.4 \pm 0.6$, $33.5 \pm 1.72$, and $0.024 \pm 0.008$ pCi/g, respectively. Europium-152 is a potential contaminant, but was not detected in 1997 sampling. Soil-vapor concentrations of 1,1,1-TCA and other organic compounds are unknown, but, based on the results of the active soil gas test, are expected to be in the low ppm to high ppb range.

Maximum concentrations of Cs-137, Co-60, Sr-90, and Pu-239/240 observed in FY-97 samples collected in the adjacent ditch were $57.4 \pm 1.9$, $1.4 \pm 0.1$, $20.6 \pm 1.2$, and $0.47 \pm 0.05$ pCi/g, respectively. The highest concentrations of all contaminants are expected to occur closest to the former OMRE site. However, enough uncertainty exists to warrant caution in all locations to be sampled.

## D-1.4 Scope of Work

The planned scope of work for characterizing the OMRE includes:

- Collection of surface soils between 0 to 0.15 m (0 to 0.5 ft) using trowels or hand augers
- Collection of incremental subsurface samples to basalt using a drill rig

- Collection of groundwater samples
- Collection of core samples to the first interbed using a coring rig.

The sampling at OMRE will require aquifer wells and core drilling into basalt interbeds. The aquifer is approximately 152 m (500 ft) below land surface and the interbed is approximately 23 m (75 ft) below land surface. The location for the ground water monitoring well (STF-MON-A-003) that will be drilled near OMRE was selected after evaluating the dip and thickness of the interbed material in other nearby wells. The locations for the monitoring well and the interbed boreholes are shown in Figure D-2. The location for the second well (STF-MON-A-004) depends on the data from this initial round of sampling.

For detailed information regarding the scope of work and the methods used for sample collection activities, refer to the OU 10-04 Work Plan (DOE-ID 1999b) and FSP (DOE-ID 1999a).

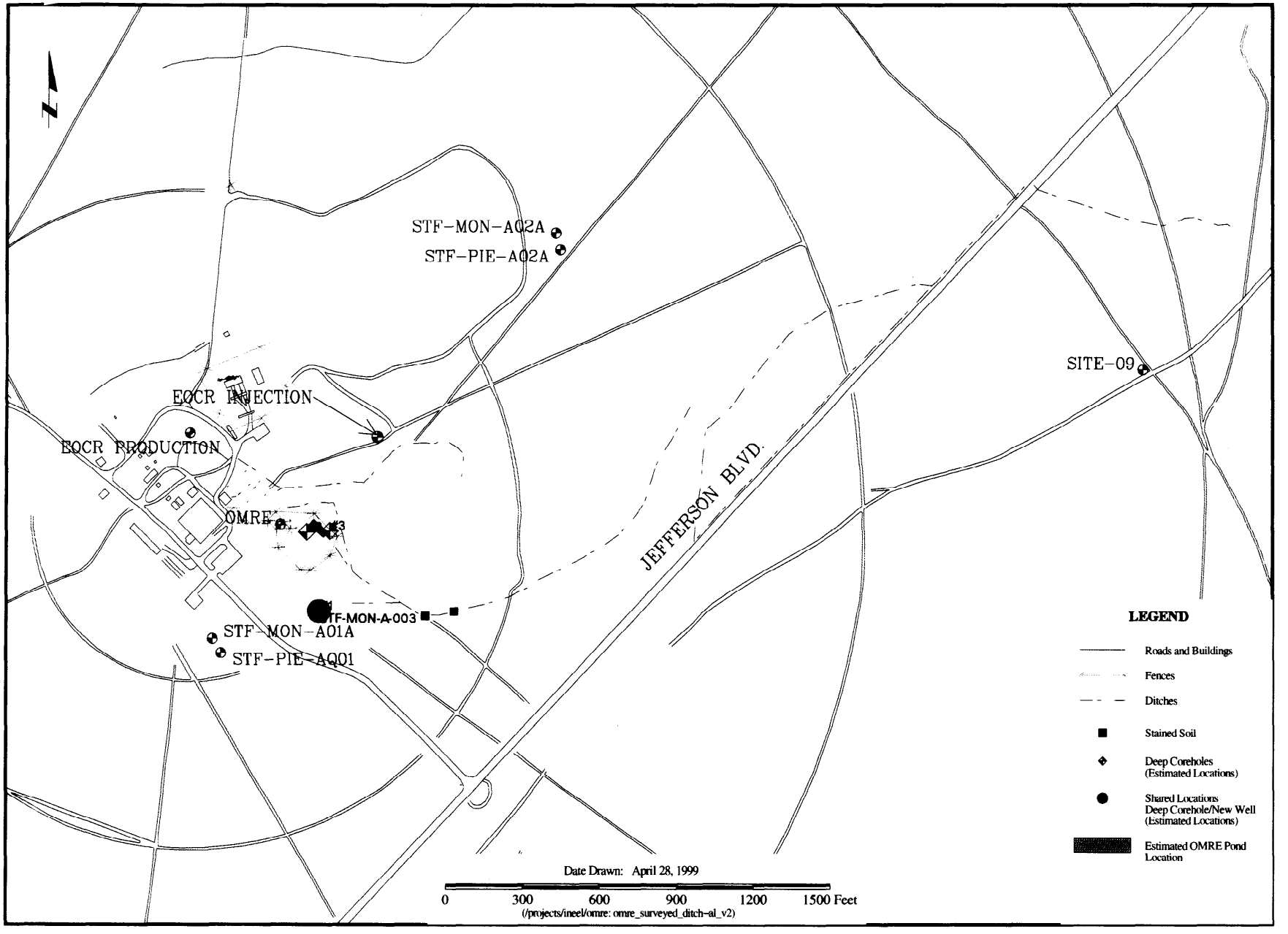


**Figure D-2.** Proposed location of the OMRE monitoring well, STF-MON-A-003, and interbed boreholes.

# D-2. KEY SITE PERSONNEL RESPONSIBILITIES

The organizational structure for this project reflects the resources and expertise required to perform the work, while minimizing risks to worker health and safety, the environment, and the general public. The names of the individuals in key roles at the site, and lines of responsibility and communication, are shown on the organizational chart for the site (Figure D-3). Descriptions and responsibilities of key site personnel are detailed in Section 2 of the HASP. Descriptions and responsibilities of additional key site personnel specific to the ORME project are given below.

## D-2.1 Construction Manager

The construction manager (CM) is responsible for field implementation of the project. This responsibility involves ensuring the all project tasks receive appropriate health and safety review before commencement, and that the necessary equipment and facilities are made available to implement the provisions of this plan.

The CM is also responsible, in conjunction with the field team leader (FTL), for the safe and successful completion of assigned project tasks. The CM assists the FTL in managing field operations, executing the work plan, enforcing site control, documenting task-site activities, and conducting daily safety briefings at the start of the work activities each day.

## D-2.2 Drilling Team

The drilling team (considered to be task-site personnel) will be led by the CM and the FTL. The drilling team will perform the onsite tasks, as detailed in the FSP. All task-site personnel shall understand and comply with the requirements of the HASP. The CM or FTL will brief task-site personnel at the start of the work activities each day.

Task-site personnel are responsible to notify the CM, FTL, and/or health and safety officer (HSO) of any potentially unsafe situations or conditions. If unsafe conditions develop, task-site personnel are authorized to stop work and make the necessary notifications.

## D-2.3 Ordnance Safety Professional

The ordnance safety professional provides ordnance recognition training, as required by Management Control Procedure (MCP) 2725. In addition, if ordnance is identified onsite, all work will be stopped, the area will be evacuated to at least 91.4 m (300 ft), initially, and the ordnance safety professional will be notified to mitigate the hazard.

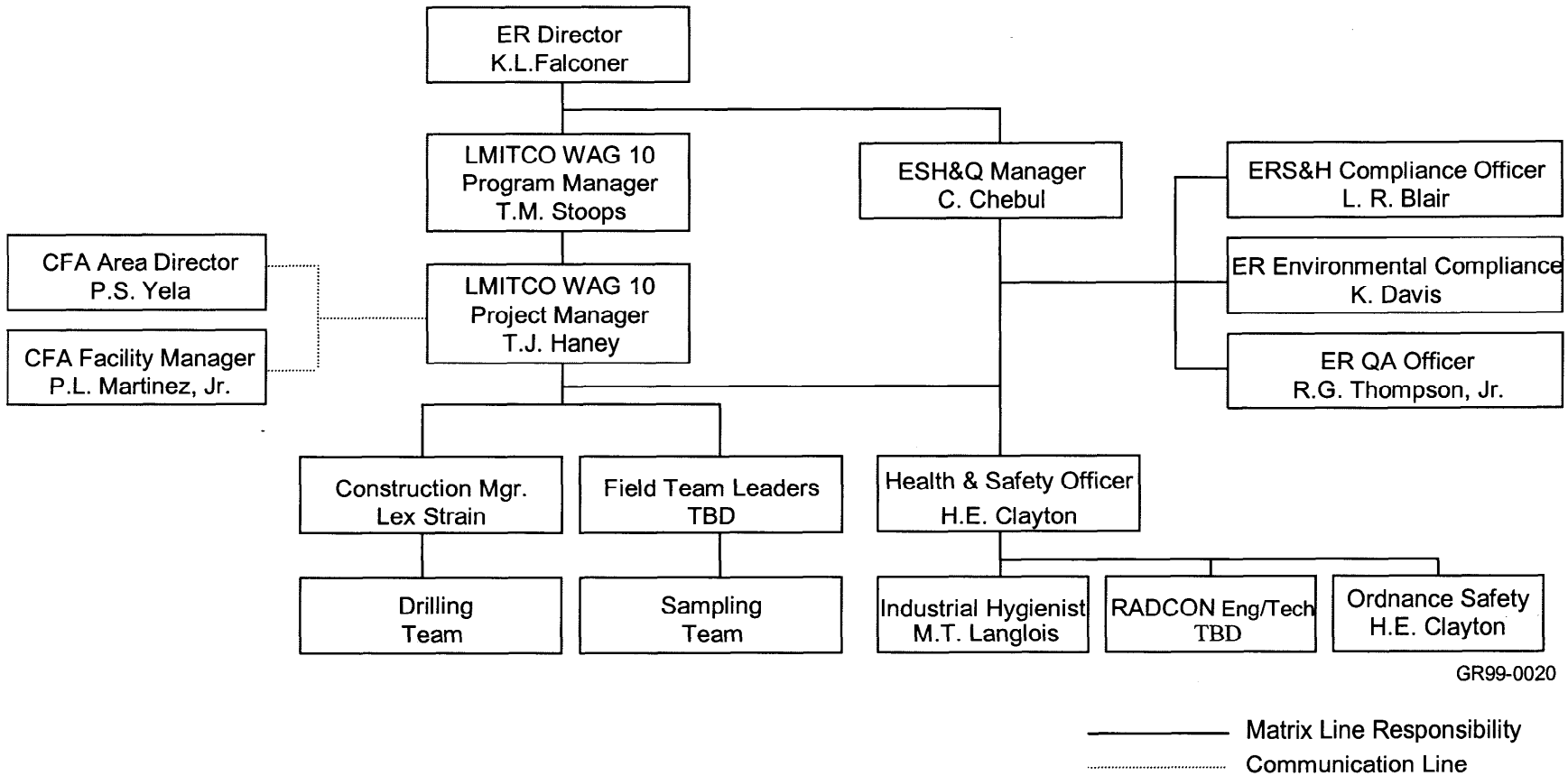


**Figure D-3.** Organizational chart for OMRE field work.

# D-3. RECORDKEEPING REQUIREMENTS

Section 3 of the HASP gives information and requirements regarding recordkeeping requirements. In addition, information and requirements regarding OMRE site-specific records are detailed below.

## D-3.1 Drilling Logs

All drilling logs and other related reports shall be submitted to the LMITCO Administrative Record and Document Control (ARDC). The ARDC shall organize and maintain data and reports generated by Environmental Restoration Program field activities. The appropriate information pertaining to the drilling activities will be recorded in accordance with MCP-231, "Logbooks."

## D-3.2 Maintenance Logbook for Drill Rig

This information is incorporated in the drilling subcontractor's quality plan, which requires proper and timely implementation of the specific quality assurance requirements identified in the contract documents.

## D-3.3 Daily Operational Status Log

This information is incorporated in the drilling subcontractor's quality plan, which requires proper and timely implementation of the specific quality assurance requirements identified in the contract documents.

# D-4. PERSONNEL TRAINING

All site personnel shall receive training as specified in OSHA 29 CFR 1910.120/1926.65 and the LMITCO *Safety and Health Manuals*. Radiation workers shall be trained according to the LMITCO *Radiation Protection Manual,* MCP-126, "Training." Specific training requirements for each worker may vary depending on the hazards associated with their individual job assignment and required access into radiologically controlled areas.

Proof that all required training courses have been completed (including applicable refresher training) must be maintained on the site at all times. Examples of acceptable written training documents include: LMITCO, "40 Hour OSHA HAZWOPER Card," LMITCO, "Respirator Authorization Card," "DOE Certificate of Core Radiological Training II Card," "Medic/First Aid Training Card," and/or a copy of an individual's or department's TRAIN System printout demonstrating completion of training. A copy of the certificate issued by the institution where the training was received is also acceptable proof of training. The DOE radiological worker training must be documented on an official authorized card (blue DOE seal in upper left corner) and have the designated INEEL site-specific training stamped or written on the card (unless issued before March 1997).

Before beginning work at the site, site-specific training will be conducted by the FTL or HSO. This training will consist of a complete review of the HASP and attachments, with time for discussion and questions. At the time of this training, personnel training records will be checked and verified to be current and complete for all required training. Upon completing site-specific training, personnel will sign the training acknowledgement form indicating that they have received this training, understand the tasks and associated hazards that will be conducted, and agree to follow all HASP and other safety requirements. Ordnance Awareness and Cultural Resources Protection Training are also required prior to initiating field work.

For this project, the FTL or HSO will monitor each 40-hour HAZWOPER-trained worker's performance for 3 days of site activities. After observing satisfactory work performance, the supervisor will complete the observation checklist, and the worker will sign the Field Experience Acknowledgment Form, indicating that they have demonstrated acceptable performance during the 3 days of actual HAZWOPER activities. This will satisfy the HAZWOPER initial 24-hour supervised field experience. A copy of this form will be provided to the worker.

The LMITCO training records shall be forwarded to the LMITCO Environmental Operations (EO) training coordinator (MS 3902) for retention in the employee training records (TRAIN).

The FTL, HSO, and radiological control technician (RCT) will conduct a daily prejob safety briefing of the task(s) to be performed that day, as applicable. During this briefing, tasks are to be outlined, hazards identified, hazard controls and work zones established, PPE requirements discussed, and employees' questions answered. At the completion of this briefing work control documents will be read and signed (safe work permit(s) [SWP(s)], radiological work permit(s) [RWP(s)], etc.). Particular emphasis will be placed on lessons learned from the previous day's activities and how tasks can be completed in the safest, most efficient manner. All personnel will be asked to contribute ideas to enhance worker safety and mitigate potential exposures at the site. Table D-1 identifies the required training for the OMRE site personnel.

**Table D-1.** Required training for the OMRE site personnel.

| Task/Position (Topic) | FTL and HSO (Required) | Field Team (Required) | Construction Manager (Required) | Drilling Team (Required) | Non-Workers[a] (Required) | Visitors[b] (Required) |
|---|---|---|---|---|---|---|
| Site-specific training[c] | X | X | X | X | X | X |
| Decontamination[d] | X | X | X | X | X | X |
| Hazard communication[d] | X | X | X | X | X | X |
| Fire Extinguisher Training[d] | X | X | X | X | X[e] | |
| Site control and warning devices[d] | X | X | X | X | X | X |
| HASP Emergency Response Plan (Section 11)[b] | X | X | X | X | X | X |
| 40-hour HAZWOPER[f] | X | X | X | X | X | |
| 8-hour HAZWOPER site supervisor | X | | | | | |
| Hearing conservation | X[g] | X[g] | X[g] | X[g] | X[g] | X[g] |
| DOE Radiological Worker II | X | X | X | X | X[d] | |
| CPR and Medic First Aid[e] | X | X[h] | | | | |
| Ordnance Awareness | X | X | X | X | X | X |
| Cultural Resources Protection | X | X | X | X | X | X |
| Respirator qualification and fit test | X[i] | X[i] | X[i] | X[i] | | |
| HAZMAT employee general awareness training[j] | X | X | | | X | |

a. Nonworkers (occasional site workers) who must enter the exclusion zone (EZ) are required to have the training necessary to perform their assigned tasks within the EZ. This may include the same training as FTL (depending on the task location).

b. Visitors are required to meet the nonworker training requirements, at a minimum, if they enter the EZ.

c. Training will be documented using the HASP acknowledgement forms (site-specific training and 24-hr supervised experience).

d. Will be included in site-specific training.

e. Two Medic First/CPR qualified individuals must be present during site activities.

f. Includes 40 hours of classroom instruction and 24 hours of supervised field experience.[c]

g. As required based on project duties and site zone access requirements.

h. At least one other member (other than the FTL) must be trained.

i. If entering areas requiring respirator use.

j. If identified as "HAZMAT" employee (anyone who directly affects hazardous material transportation safety by handling, packaging, labeling, loading, unloading, moving, driving, etc. [per 49 CFR 171.8]).

# D-5. OCCUPATIONAL MEDICAL SURVEILLANCE PROGRAM

There are no site-specific changes to the Occupational Medical Surveillance Program. For information regarding Occupational Medical Surveillance Programs requirements, see Section 5 of the HASP.

# D-6. ACCIDENT PREVENTION PROGRAM

For general information regarding the Accident Prevention Program, refer to Section 6 of the HASP. In addition, specific safety practices related to coring and drilling activities will be followed at the task site include:

- Conduct a utility survey, and obtain a facility excavation permit prior to commencing drilling operations.
- Conduct a walk-around inspection of drilling equipment.
- Inspect all bolts, guards, covers, and mechanical components of the drill rig to make sure they are in place and undamaged.
- When removing tank caps or inspecting fluid levels, wear safety glasses with side shields and gloves. Remove the caps slowly and carefully to allow vapors to dissipate.
- Inspect hydraulic oil, coolant, and air systems for safe working order.
- Check safety chains or suitable locking devices at all connections of high-pressure hose lines, ¾-inch or larger inside diameter, where a connection failure could create a hazard.
- Check fire extinguishers to make sure they are in place and fully charged, and the proper type for the work involved.
- If compressed gas cylinders are present, check to be sure that they are secured in an upright position. Keep covers over valves when not in use.
- Dress appropriately. Do not wear any clothing that fits excessively loose or has drawstrings attached. Comply with PPE requirements, as specified in Section 9 of the HASP, or modified by the HSO, RCT, or IH, and noted in the SWP/RWP.
- If necessary to climb a mast, ensure the drill rig is in the nonoperational mode, and climb on the correct side. Use of a safety harness is required.
- Drill mast, when vertical, must be greater then twice the mast height away, in a horizontal path, from overhead power lines.
- Suspend drilling operations during severe weather conditions, such as high winds (>25-mph sustained, 35-mph gusts).
- Always wear hearing protection when working around noises that are above 85 decibel A-weighted (dBA) for a 8-hour time-weighted average (TWA) and 83 dBA for a 10-hour TWA.

# D-7. SITE CONTROL AND SECURITY

For definitions and descriptions of the various zones and areas used to control site access, tasks, and uses (exclusion zone, contamination reduction zone and corridor, support zone, etc.), refer to Section 7 of the HASP. The FTL, HSO, IH, construction engineer, and RCT will determine the configuration of the work zones based on site characteristics, personnel and equipment requirements, and other mitigating factors. The planned controlled work zones for the OMRE site is presented in Figure D-4.

## D-7.1 Support Zone

A support zone will be established around each drill site. The radius of the support zone will be a minimum of 1-1/2 times the length of the drill mast (see Figure D-4). This zone will include all drilling, installation, and completion activities. Entry into task-site work zones must be controlled through the appropriate use of barriers, signs, and other measures per the LMITCO *Safety and Health Manual*, MCP-2714. Employees not directly involved with the activity shall be excluded from entering work zones. Nonworkers, such as inspectors, may be admitted to the task site if they are on official business, are escorted by the HSO, FTL, or CM, and have demonstrated compliance with the training requirements in Section 4 of the HASP and D-4 of this FSP.

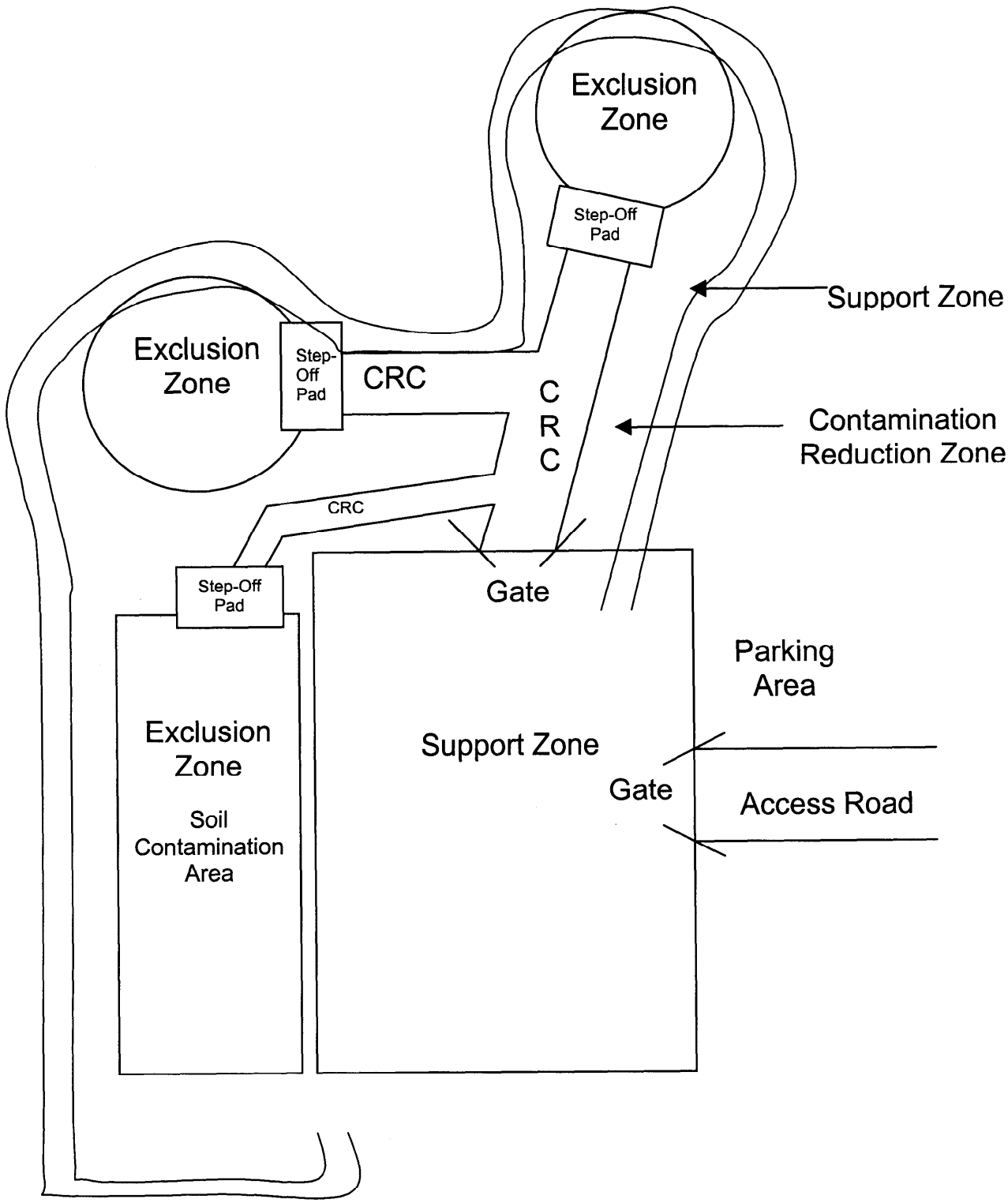


**Figure D-4.** Proposed work zones for drilling and coring at the OMRE area.

# D-8. HAZARD ASSESSMENT

Section 8 of the HASP provides general information regarding the types of hazards that may be encountered while performing field work at the OMRE site. Specific hazards associated with OU 10-04 RI/FS OMRE site are presented in this section.

Table D-2 summarizes the anticipated activities and task to be performed and the types of hazards that may be associated with the tasks.

Table D-3 provides an evaluation of the contaminants that may be encountered during field activities and details on exposure limits, routes of exposure, symptoms of overexposure, and the potential for exposure.

Table D-4 provides the ORME project monitored hazards.

Table D-5 outline specific monitoring requirements and monitoring equipment that may be used for specified tasks or activities.

Table D-6 indicates action levels for specified contaminants and the response required if the action level is exceeded.

## D-8.1 Fire and Explosion Hazards

Explosion and fire hazards at the task site are associated with the use of diesel fuel for the drill rig and air compressor equipment. The power equipment will be refueled only after the equipment has completely cooled and all sources of spark and flame will be maintained at least 15 m (50 ft) from any fuel source. Flammable/combustible liquids, such as fuels or solvents that will be used at the task site will be safely stored, handled, and used, and will include proper container labeling. Flammable and combustible liquids will be handled per LMITCO *Safety and Health Manual*, MCP-584, "Flammable/Combustible Liquids."

**Table D-2**. OU10-04 OMRE activities and associated hazards.

| Activity or Task | Associated Hazards or Hazardous Agent |
|---|---|
| Premobilization | Equipment movement/vehicle traffic<br>Lifting/back strain |
| Performance of Work | Chemical/inorganic contaminants<br>Radiological<br>Equipment movement/vehicle traffic<br>Lifting/back strain<br>Heat or cold exposure<br>Slip/trip/fall<br>Fire/explosion<br>Electrical/energized systems<br>Elevated work area<br>Excavation<br>Welding |
| Demobilization and Closeout | Chemical/inorganic contaminants<br>Equipment movement<br>Lifting/back strain |

**Table D-3.** Evaluation of radiological and nonradiological contaminants at the OMRE site.

| Material or Chemical (CAS #) | Exposure Limit[a] | Routes of Exposure[b] | Symptoms of Overexposure[c] | Target Organs or System | Carcinogen? (source)[d] | Exposure Potential[e] |
|---|---|---|---|---|---|---|
| **Radionuclides** | | | | | | |
| Cs-137 | DAC—7.0E-08 μCi/cm$^3$ | Inh | NA | Lung, bone marrow, kidney, whole body | Yes (EPA) | Low |
| Co-60 | DAC—1.0E-08 μCi/cm$^3$ | Inh | NA | Lung, bone marrow, kidney, whole body | Yes (EPA) | Low |
| Eu-152 | DAC—1.0E-08 μCi/cm$^3$ | Inh | NA | Lung, bone marrow, kidney, whole body | Yes (EPA) | Low |
| Sr-90 | DAC—2.0E-09 μCi/cm$^3$ | Inh | NA | Lung, bone marrow, kidney, whole body | Yes (EPA) | Low |
| U-234 | DAC—2.0E-11 μCi/cm$^3$ | Inh | NA | Lung, bone marrow, kidney, whole body | Yes (EPA) | Low |
| U-238 | DAC—2.0E-11 μCi/cm$^3$ | Inh | NA | Lung, bone marrow, kidney, whole body | Yes (EPA) | Low |
| **Organic Compounds** | | | | | | |
| Methyl Chloroform 71-55-6 | TLV—350 ppm | Inh, Ing | Anesthesia, dermatitis, CNS depression, liver/kidney damage | CNS, skin, liver, kidney | No | Low |
| 1,2-Dichloroethane 107-06-2 | TLV—10 ppm | Inh, Ing | Anesthesia, dermatitis, CNS depression, liver/kidney damage | CNS, skin, liver, kidney | NTP YES IARC YES | Low |
| 1,1-Dichloroethene 75-35-4 | TLV—5 ppm PEL—1 ppm | Inh, Ing | Anesthesia, dermatitis, CNS depression, liver/kidney damage | CNS, skin, liver, kidney | No | Low |
| Chloroform 67-66-3 | TLV—10 ppm PEL—50 ppm | Inh, Ing, abs | Anesthesia, dermatitis, CNS depression, liver/kidney damage | CNS, skin, liver, kidney | Yes ACGIH A2 | Low |
| Trichloroethylene 79-01-6 | TLV—50 ppm PEL—100 ppm | Inh, Ing | Anesthesia, dermatitis, CNS depression, liver/kidney damage | CNS, skin, liver, kidney | No | Low |
| PCB's 11097-69-1 | TLV—0.5 mg/m$^3$ | Inh, Ing, abs | CNS depression, dermatitis | Skin, liver, CNS | IARC Yes | Low |

a. American Conference of Government Industrial Hygienists (ACGIH) 1997 TLV Booklet and OSHA 29 CFR 1910 substance specific standards.
b. (Inh) inhalation; (Ing) ingestion; (abs) skin absorption; (Con) contact hazard.
c. (CNS) dizziness/nausea/lightheadedness; (dermis) rashes/itching/redness; (respiratory) respiratory effects; (eyes) tearing/irritation.
d. If yes, identify agency and appropriate designation (ACGIH A1 or A2; NIOSH; OSHA; International Agency for Research on Cancer (IARC); NTP).
e. Estimates (≈) of specific compounds.

VD = vapor density (Air = 1) CNS = central nervous system CVS = cardiovascular system RESP = respiratory system NA = not applicable
GI = gastrointestinal PEL = permissible exposure limit TLV = threshold limit value REM = roentgen equivalent man DAC = derived air concentration

**Table D-4.** The OMRE project monitored hazards.[a]

| Task or Activity | Radiological and Nonradiological Hazards Monitored |
|---|---|
| Phase I:<br>Mobilization<br>Moving equipment on to the OMRE project task site | Manual material handling<br>Slips, trips and falls<br>Overhead hazards |
| Phase II:<br>Performance of Work[a] | Heat and/or cold stress<br>Manual material handling<br>Slips, trips and falls<br>Fire/explosion<br>Electrical/energized systems<br>Elevated work area<br>Excavation<br>Welding<br>Overhead hazards<br>Heavy equipment operation<br>Pinch points<br>Noise<br>VOCs<br>Radiological hazards |
| Phase III:<br>Demobilization and Closeout | Manual material handling<br>Slips, trips and falls<br>Overhead hazards |

a. Monitoring and sampling will be conducted as deemed appropriate by project IH and RADCON personnel based on specific tasks and site conditions.

VOC = volatile organic compounds.

**Table D-5**. Monitoring equipment for monitoring radiological and nonradiological hazards.[a]

| Monitored or Sampled Chemical or Radiological Hazard | Monitoring/Sampling Equipment Method | |
|---|---|---|
| Radionuclides (beta-gamma) | Ludlum 2A or equivalent | Sampling equipment, sample material, and personnel beta-gamma contamination |
| Radionuclides (alpha) | Ludlum 61 or equivalent | Sampling equipment, sample material, and personnel beta-gamma contamination |
| VOC's | PID or detector tubes | Breathing zones, samples |
| Noise | Sound level meter and/or noise dosimeter | Decibel A-weighted (dBA) instantaneous reading |
| Heat/cold stress | Heat Stress—WBGT, body wt, fluid intake | Cold Stress—ambient air temp, wind chill charts |

a. Air sampling will be conducted as deemed appropriate by project IH and RADCON personnel based on initial direct reading instrument data, swipes, and other site factors (homogeneity of coring material, radiological contamination/fields, external waste residue, etc.).

VOC = volatile organic compound

WBGT = wet bulb globe test

PID = photoionization detector

**Table D-6**. Action levels and associated responses for project hazards.

| Contaminant/Agent Monitored | Action Level (AL) | Response Taken if AL Exceeded |
|---|---|---|
| VOC's | 5 ppm sustained in breathing zone for 2 minutes | Stop work, evaluate PPE to Level C including respirators |
| Radionuclides beta or gamma | Contamination (removable) >1,000 disintegrations per minute (dpm)/100 $cm^2$ | Stop work, upgrade PPE as directed by RCT, and upgrade zone to 'Contamination Area' |
| | Radiation levels >5 mrem/hour | Stop work, upgrade zone to 'Radiation Area', evaluate dosimetry requirements |
| Radionuclides alpha | Contamination (removable) >20 dpm/100$cm^2$ | Stop work, upgrade zone to 'Contamination Area', evaluate PPE requirements as directed by RCT |
| Airborne radioactivity | Contamination ($\mu Ci/cm^3$) > 10% of any derived air concentration value | Stop work, upgrade zone to 'Radiation Area' evaluate PPE and respiratory requirements as directed by RCT |
| Noise | >85 dBA instantaneous reading | Use of hearing protection devices as prescribed by IH |

VOC = volatile organic compound

## D-8.2 Electrical Hazards, Energized Systems

Overhead power lines, downed electrical wires, and buried cables pose shock or electrocution hazards. Overhead electrical hazards will be identified by operating personnel before raising masts on drill rigs or using cranes. Minimum distances for working near overhead power lines, found in LMITCO *Safety and Health Manual*, MCP-3000, "Hoisting/Rigging," and DOE-STD-1096-96, "Hoisting and Rigging," will be followed. The requirements in the LMITCO *Safety and Health Manual*, MCP-2731, "Electrical Safety" will be followed for all work performed near overhead lines.

Before beginning drilling or excavating operations, underground utility clearances will be obtained by contacting Telecommunications at 526-1688 or 526-2512. Subsurface investigation clearance will be obtained in accordance with LMITCO *Facilities and Maintenance Manual*, MCP-151, "Subsurface Investigations." The requirements for advanced 48-hour notice will be met.

## D-8.3 Elevated Work Area

When performing certain task-site activities, employees may be required to work on elevated equipment or at heights. When such work is performed, employees shall comply with the LMITCO *Safety and Health Manual*, MCP-2710, "Fall Protection" and the following applicable MCPs: MCP-2709, "Aerial Lifts and Elevating Work Platforms," MCP-2711, "Ladders," MCP-2712, "Scaffolding," and MCP-2713, "Walking and Working Surfaces."

## D-8.4 Excavation

Excavation work can pose a number of hazards including but not limited to cave-ins, engulfment, sudden subsidence of soil, breech of underground containers, and water accumulation. Work involving excavations for the purpose of drilling surface boreholes require drilling a 35.5 cm (14-in.) diameter hole to 1.5 m (5 ft) in competent basalt. The drill steel will be in the borehole during most of the activities at the drill sites. However, if the drill steel is not in the borehole, a cover will be placed over the borehole. All excavations at the task site shall meet the requirements outlined in the LMITCO *Safety and Health Manual*, MCP-2733, "Excavation and Surface Penetrations."

## D-8.5 Welding

Welding may be necessary at the job site, and can pose a number of hazards including an increased fire potential. Work involving welding shall meet the requirements outlined in the LMITCO *Safety and Health Manual*, MCP-2718, "Welding, Cutting, and Other Hot Work."

# D-9. PERSONAL PROTECTIVE EQUIPMENT

The PPE requirements (Table D-7) and assigned respiratory protection factors (Table D-8) for OMRE activities are outlined below. For information describing the types of PPE and the levels of PPE, refer to Section 9 of the HASP.

**Table D-7.** The PPE requirements and modifications for OU 10-04 OMRE sampling.

| Task or Assignment | Level of PPE | Modifications and Comments |
|---|---|---|
| **PHASE I ACTIVITIES** | | |
| Preparation of sampling equipment, mobilization and deployment | Modified Level D | Work clothes or coveralls, work gloves, eye protection, and head protection as warranted. |
| **PHASE II ACTIVITIES** | | |
| 1. Sample collection | Modified Level C | Anti-C clothing, modesty garments, latex gloves, latex boot covers, eye protection, and head protection as warranted. |
| 2. Equipment Decontamination | Modified Level C | Anti-C clothing, modesty garments, latex gloves, latex boot covers, eye protection, and head protection as warranted. |
| 3. Coring and Drilling Activities | Modified Level C | Anti-C clothing, modesty garments, latex gloves, latex boot covers, eye protection, and head protection as warranted. |
| 4. Sample preparation and shipment after removal from exclusion zone | Modified Level D | Work clothes or coveralls, work gloves, eye protection, and head protection as warranted. |
| **PHASE III ACTIVITIES** | | |
| Demobilization and closeout | Modified Level D | Work clothes or coveralls, work gloves, eye protection, and head protection as warranted. |

a. Radiological surveys and swipes will be collected before dismantlement of the CA. If contamination is found, a decontamination effort will be conducted to remove the source. If the contamination is determined to be fixed, then the contaminated material or area will be removed or contained, as appropriate.

**Table D-8.** Assigned respiratory protection factors.[a]

| Type of Respirator | Respiratory Inlet Covering (full facepiece) |
|---|---|
| Full Face Air Purifying Respirator | 50X |

# D-10. DECONTAMINATION PROCEDURES

Every effort will be made to prevent contamination of personnel and equipment through the use of engineering controls, isolation of source materials, continuous site monitoring and surveying, personnel contamination control training, and by following all contaminated material handling requirements and procedures. For information describing the control and prevention of contamination and emergency decontamination procedures, refer to Section 10 of the HASP.

For radiological decontamination, the assigned RCT will provide guidance and instructions to field workers as to the methods and levels of deconning required. For additional information regarding the decontamination procedures, refer to the OU 10-04 Work Plan (DOE-ID 1999b)/FSP (DOE-ID 1999a).

# D-11. EMERGENCY RESPONSE PLAN

General information regarding Emergency Response Plans, (including types of emergency events, emergency facilities, emergency communications, emergency response roles and responsibilities, recognition of emergency warnings, and reentry/recovery after an emergency event) are covered in Section 11 of the HASP. Site-specific information such as emergency equipment, emergency contact lists, and location of CFA Medical Facilities is covered in this section.

Per MCP-2725 (*Field Work at the INEEL)*, the CFA Emergency Response Organization will ensure personnel performing field work are notified of emergency conditions and the appropriate actions to take via radio and/or pager communications. As such, it is required that the FTL or HSO is available and able to communicate with field workers at all times. At the site to be sampled, the routes to the CFA Medical Facilities will be reviewed. Table D-9 identifies the emergency response equipment that will be maintained at the OMRE site.

Table D-10 provides the project emergency contact list that must be posted at the jobsite.

In the event of an emergency, be prepared to provide the following information to the emergency response organization:

- Your name, telephone number, pager number
- Exact location of the emergency
- Nature of the emergency including time of occurrence, current site conditions, and special hazards in the area
- Injuries, if any, including numbers of injured, types of injuries, conditions of injured
- Additional information as requested.

Figure D-5 provides a map of the CFA Medical Facility location.

**Table D-9**. Emergency response equipment maintained at the OMRE site.

| Equipment Name and Quantity Required | Location at Task Site | Responsible Person | Frequency of Inspection |
|---|---|---|---|
| Fire extinguishers[a] | Trailer, vehicle, drill rig | FTL, HSO, or IH | Weekly |
| First aid supplies | Trailer | FTL, HSO, or IH | Weekly |
| Eyewash station | At step off pad | FTL, HSO, or IH | Weekly |
| Hazardous materials spill kit | Trailer or vehicle | FTL, HSO, or IH | Monthly |
| Radiological spill kit | Trailer or vehicle | FTL, RCT, HSO, or IH | Monthly |
| Communication equipment available | Trailer or vehicle | FTL, HSO, or IH | Daily |
| Shovel | Trailer or vehicle | FTL, HSO, or IH | Daily |

a. Consult the assigned LMITCO safety and fire protection engineer to determine appropriate type and quantity of fire extinguisher(s).

**Table D-10.** Project emergency contact list posted at the job site.

| Contact Title | Contact Name | Phone No./ Radio Net | Pager Number |
|---|---|---|---|
| Warning Communications Center (WCC) | | 777, 6-1515, KID-240 | |
| CFA Facility Manager | Paul Martinez | 6-2150 | 6646 |
| CFA Area Director | Paul Yela | 6-8899 | 6264 |
| CFA ESH&QA Supervisor | Robert MacFarlane | 526-8205 | 5712 |
| First Aid (CFA Medical Dispensary, CFA-1612) | | 777, 6-2356 | |
| Occupational Medical Program | | 6-1596 | |
| Fire/Security | | 777 | |
| LMITCO ER Project Manager | Tom Haney | 6-9407 | 4081 |
| LMITCO ER Project Health and Safety Officer | Hance Clayton | 521-8404 | 7557 |
| LMITCO CFA Radiological Control | John Marthis | 6-2558 | 6072 |
| LMITCO ER Industrial Hygiene | Mark Langlois | 6-0127 | 9042 |
| LMITCO Field Team Leader | TBD | 6-8529 | 5484 |
| LMITCO ER S&H Compliance Officer | Lawrence Blair | 6-4113 | 5869 |
| LMITCO ER Environmental Compliance Officer | Katherine Davis | 6-4949 | 7833 |
| LMITCO ER ES&H/QA Manager | Charles Chebul | 6-9566 | 5689 |
| CFA DOE-ID Facility Representative | Roderick Taft | 6-8838 | 6250 |

ESH&QA = environment, safety, health, and quality assurance

S&H = safety and health

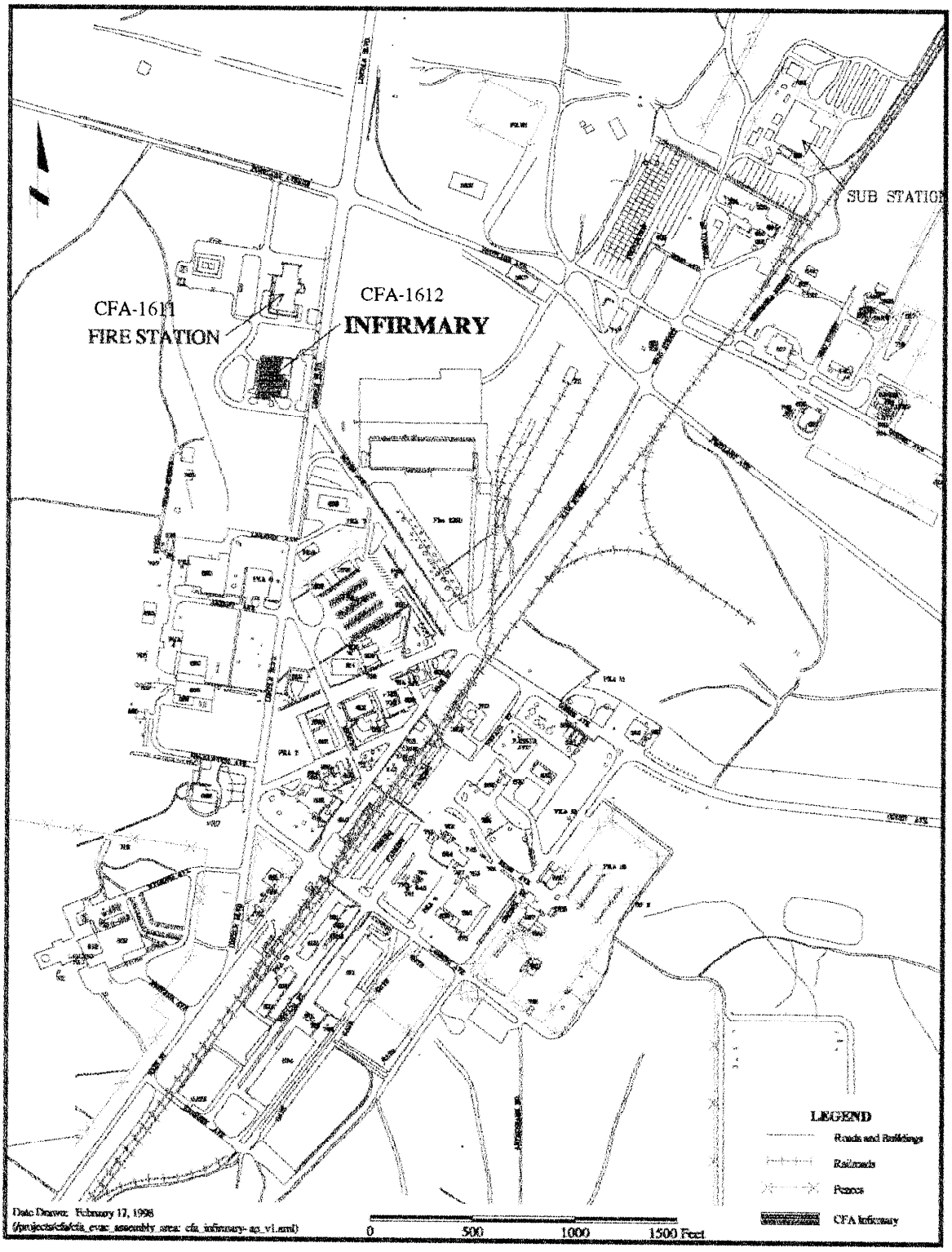


**Figure D-5.** Location of Medical Facilities at CFA.

# D-12. NOTIFICATION RESPONSIBILITIES

The reference list provided in Table D-11 will be posted at each support zone and sent to the offices of those assigned notification responsibilities.

**Table D-11.** Notification responsibilities.

| Responsible Person or Organization | | Phone | Pager | Radio |
|---|---|---|---|---|
| FTL or HSO notifies | INEEL Emergency Response Telephone Number | 777 | — | KOK 130 |
| FTL or HSO notifies | Warning Communication Center (WCC) | 777 or 526-1515 | — | KID 240 |
| FTL or HSO notifies | INEEL Spill Notification Team (SNT), for spills | — | 6400 | — |
| FTL or HSO notifies | INEEL Occupational Medical Program, for occupational illness or injury | 526-1596 | — | — |
| FTL or HSO notifies | CFA Facility Manager | 526-2150 | 6646 | — |
| FTL or HSO notifies | CFA Area Director | 526-8899 | 6264 | — |
| FTL or HSO notifies | CFA ESH&QA Supervisor | 526-8205 | 5712 | — |
| FTL or HSO notifies | LMITCO Project Manager | 526-9407 | 4081 | |
| FTL, HSO, or PM notifies | LMITCO ER S&H Compliance Officer | 526-4113 | 5869 | |
| FTL, HSO, or PM notifies | LMITCO ER Environmental Compliance Officer | 526-4949 | 7833 | |
| FTL, HSO, or PM notifies | CFA DOE Facility Representative | 526-8838 | 6250 | — |
| FTL, HSO, or PM notifies | LMITCO ER ES&H/QA Manager | 526-9566 | 5689 | — |

PM = project manager

# D-13. REFERENCES

Chapin, J.A., 1979, *OMRE Leach Pond Characterization Final Report*, PR-W-79-029, (not currently available for distribution).

DOE-ID, 1999a, *Field Sampling Plan for Operable Unit 10-04 Organic-Moderated Reactor Experiment Soil and Ground Water (Draft)*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10621, Revision 0, April.

DOE-ID, 1999b, *Work Plan for Waste Area Group 6 and 10 Operable Unit 10-04 Comprehensive Remedial Investigation/Feasibility Study*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10554, Revision 0, April.